(1) Referring to your Office Communication dated 10/29/08, I present to you my opinion as follows:

(i) Rejection of claim 1 under 35 U.S.C. 101 (P. 2).

With regard to the phrase on p. 2, line 11 of the Office Action, reading '...without needing any external heat source...' the present device, indeed, receives heat from the ambient air. See p.1, lines 13, 14 of my description reading "the cooled gas is reheated again by cooling (q_2) the ambient air" and, p. 2 line 13, reading "transferring heat from the ambient air, Fig. 5, (7)". The device of Fig. 5 is the main (self-contained) arrangement of my invention, and in which the cold (at about minus 40 degrees) gas (6) is reheated by the (inexpensive) ambient air (7).

With regard to the second law of thermodynamics, there is no contravention with my invention, because the law refers to a purely homogeneous gas, i.e. within the area occupied by the gas there are just molecules colliding with each other and nothing else, while in the present case the circulating gas is heterogeneous, because of the presence of the slots within the area occupied by the gas. An outside observer, who does not know about the existence of the slots inside the gas, may assume that the law is violated. But this and the fact that, at the microscopic level within the slots, the gas molecules (with their selected mean free path of 10 μm, p.3, lines 4-9 of the description) do not (statistically) collide with each other, they just rebound on/from the inner walls, so that the prevailing conditions therein do not allow us to apply the law. It has no meaning. The law, as it is expressed in theory, is actually not violated by the present device.

Therefore, it seems to me that my invention is not inoperative under 35 U.S.C. 101.

(ii) Rejection of claim 1 under 35 U.S.C. 112 (first paragraph) (p. 2).

For the same reason as in the previous paragraph, I think that my invention complies with the enablement requirement under 35 U.S.C. 112 (first paragraph).

(iii) Rejection of claim 1 under 35 U.S.C. 112, (first paragraph) (p. 3).

The new proposed amended claim 1, still contains the phrase 'with a macroscopic length of 20mm (not 30mm, as inadvertently was written on p.3, line 9 of the Office Action dated 10/29/2008), because it actually appears, in my original description, (amended Fig.2, No 30).

At this point I would like to remark the following:

Referring to the claim filed with my transmittal letter dated June 27, 2006, the characteristics numbered (i), (ii), (iii), on lines 14 to 17 are assumed to refer to the slots and not to the words 'vacuum glass vessel'. This is probably due to poor linguistic expression. On line 13, I should have written '..., said slots having:', instead of '...and having:'.

Therefore, after the above explanation; it seems to me that claim 1 complies also with the written description requirement.

(iv) Rejection of claim 1 under 35 U.S.C. 103(a) (p. 3).

The problem solved by the present application is indeed the same as that solved by US 5,316568 (Brown) in view of WO 94/20741 (Kim). Furthermore, the provision of a heat exchanger to transfer heat from the ambient air to the working gas flow is well-known (Kim). On the other hand, the arrangement of the slots of my invention could not be regarded by the skilled person as a matter of routine design procedure and choice, for the following reason: With reference to Fig.2, the microscopic dimension to compare is $lo = 20\mu m$ (p.3, line 5 and p.5, line 31 of the description). My computations have been carried out on the basis of a part of the slot with a length of 20μm, which means that all the dimensions of this part of slot, name it "element", are microscopic. But each "element" has only two inner surfaces (up and down in Fig.2), while the side surfaces are missing, because of the existence of the neighboring "elements". So, it is not a rectangular opening (pore, ref. Brown). It is simply a set of two diverging flat elementary surfaces, with parallel edges.

I think it is useful to remark that without the presence of the side surfaces, there results much more power output (p.9, line 28 of the description), as compared to a situation which would include also the side surfaces.

From the construction viewpoint the slots are spaces (s) between adjacent triangular rods (in form of prisms, (19), Fig.9). The same slots could not work successfully if they were opened in a membrane (ref. Brown), because of their macroscopic length of 20 mm (No 30 of Fig. 2), (also (ye) of Fig. 6 and p.6, line 18) and the plasticity of the membrane itself, that could easily produce deformation. Moreover, these slots have two more characteristics, absolutely desirable to safeguard the power output of the device:

- (1) the active inner surfaces (Fig. 9(b)) must be perfectly polished (p. 2, line 30, p. 3, line 3 and p.10, line 6 of the description) and
- (2) the value of angle ω (Fig. 2), which must be exactly defined for a maximum of power output, has been calculated by means of the simulation method (Gauss's algorithm), as applied in the present invention (by using computer programs).

I dare doubt if it is possible even for a specialized person, to easily apply these two important characteristics (1) and (2) on a slot made on a membrane. Consequently, a skilled person should have to abandon the membrane technology and imagine a quite new one (e.g. MEMS Technology, i.e. Micro-Electro-Mechanical-Systems), as in the present case, in order to be able to realize slots of such characteristics. In my opinion, that is neither a routine nor an obvious course of thought and action to be taken by a skilled person.

The above reasoning allows my invention to be considered patentable.

(v) Rejection of claim 1 under U.S.C. 103 (a) (p. 4).

For the same reasons as in the previous case (Brown, Kim), regarding two more priority documents (Schultz and Goldenblum), which are similar to the previous case, it seems to me that my invention is patentable equally well.

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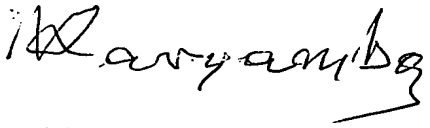
(2) Experimental data.

Although in the Office Action there is no mention about experimental data, I present here relevant information about the subject matter, hoping that it would support my opinion about the patentability of my invention.

There are no direct experimental facts about the present device. Nevertheless, in reference [1] (Annalen der Physik, 1913), mentioned in my description, Gaede, the scientist-writer of that work (Investigation on the External Friction of Gasses), made experiments on rarefied gas flowing in capillary tubes (with microscopic cross section), wherein the gas flow presented, in a particular pressure region, an anomaly i.e. external friction with values higher than expected. He succeeded in solving the problem by issuing a theory based on probabilities, from which a formula came out (p.4, formula (2) of the description of the present invention), expressing how the rebounding mechanism of the molecules upon the internal surface of the tube took place, which formula was experimentally verified with great accuracy [1]. I adopted that formula in my present invention, because I realized that this formula was exactly appropriate also for the rebounding mechanism in my device as was in Gaede's application. This means, in my opinion, that Gaede's experimental work also verifies equally well my computations used in my simulation method.

Hoping that you will find my views sufficiently satisfactory, I remain

Sincerely yours,



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